Statistical Sciences Seminar Series (CCS-6)

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An Illustration of Bayesian Nonparametric Models for Community Detection

Monday, December 10, 2012

10:30 - 11:30 AM

TA-3, Bldg. 40, Room N125 (Moon Room)

Abstract: This talk is motivated by work with Sandia National Laboratories to develop new methodology for community detection in networks. Using a well-known network data set, I consider a series of Bayesian statistical models for community detection. Under these models, nodes may or may not fall into the community structure, and the probabilities of edges forming between nodes within a community or between nodes in different communities can potentially vary with the community or pairs of communities in the network. Estimation in these models is performed through Markov Chain Monte Carlo, and community detection is carried out through a decision theory approach based on posterior samples. The Bayesian approach does not require the number of communities (or nodes not belonging to any communities) to be specified in advance, and these features are estimated from the data. For the motivating data set, I also discuss assessing the goodness-of-fit between proposed models and the data based on model checks with deviance information criterion or posterior predictive distributions of graph features.

Biography: Alyson Wilson is a Research Staff Member at the Institute for Defense Analyses Science and Technology Policy Institute. Before moving to IDA, Dr. Wilson was an Associate Professor in the Department of Statistics at Iowa State University (2008-2011), a Technical Staff Member at Los Alamos National Laboratory (1999-2008), and a senior operations research analyst at Cowboy Programming Resources (1995-1999). Her research interests include reliability, Bayesian methods, and the application of statistics to problems in defense and national security. Dr. Wilson is the current the Reviews Editor for the Journal of the American Statistical Association and The American Statistician. She is a Fellow of the American Statistical Association and an Elected Member of the International Statistical Institute. Dr. Wilson earned her B.A. in mathematical sciences from Rice University, her M.S. in statistics from Carnegie Mellon University, and her Ph.D. in statistics from Duke University.

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